What is the ODITY Threshold?

In planning, "one day in ten years" (ODITY) represents the maximum acceptable amount of time electricity generation can be at risk of being short of demand and still be considered adequately reliable.

How is the ODITY Threshold measured?

Many utilities incorporate the ODITY threshold into their long term, integrated resource planning methods by bringing it down to an annual level of temporal granularity. One day in 10 years, or 24 hours in 10 years, is often averaged to a maximum of 2.4 hours of risk allowed per year for a portfolio of resources to be considered sufficiently reliable.

WECC takes the ODITY maximum down to the hourly level to set thresholds in its probabilistic assessments of resource adequacy. This interpretation yields a threshold for each hour needing to demonstrate sufficient resource availability to meet demand 99.8% of the time.

Why does WECC use the ODITY threshold on each hour?

WECC chooses to look at the ODITY threshold for each hour rather than averaged over each year:

- To accurately account for risk;
- To study variability hour to hour; and
- To improve assumptions of import availability.

ODITY in Probabilistic Assessments: Accounting for Risk

WECC uses hourly shaped, bell curve probability distributions of demand next to those of energy availability by resource type to measure reliability.

For each hour, the distributions are compared to determine the amount of "overlap" in the upper tail of the demand distribution with the lower tail of the generation availability distribution. The amount of overlap and the probabilities associated with each percentile of the distributions can then calculate as a loss of load probability (LOLP). This is the cumulative probability associated with the overlap.

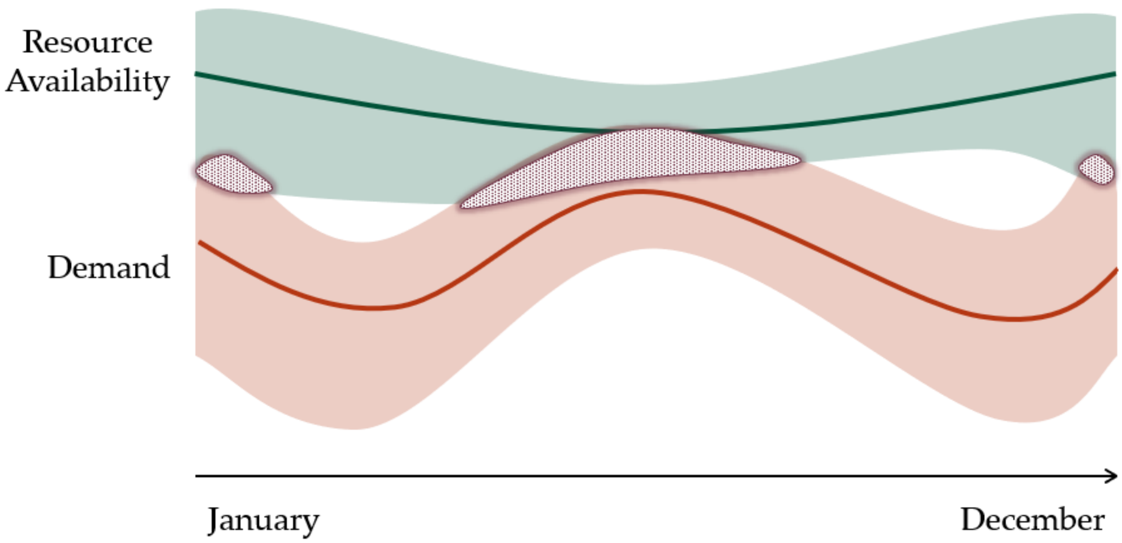

Figure 1: Annual Distribution Ranges of Demand and Resource Availability

If the probability of the resource availability falling below demand is greater than a certain threshold—in this case more than 0.02% for one of the hours—WECC notes there is a reliability shortfall in that area for that hour. A reliability threshold reserve margin (in megawatts) can be calculated to determine the shortfall in need of amelioration to maintain a level of LOLP at or less than the threshold.

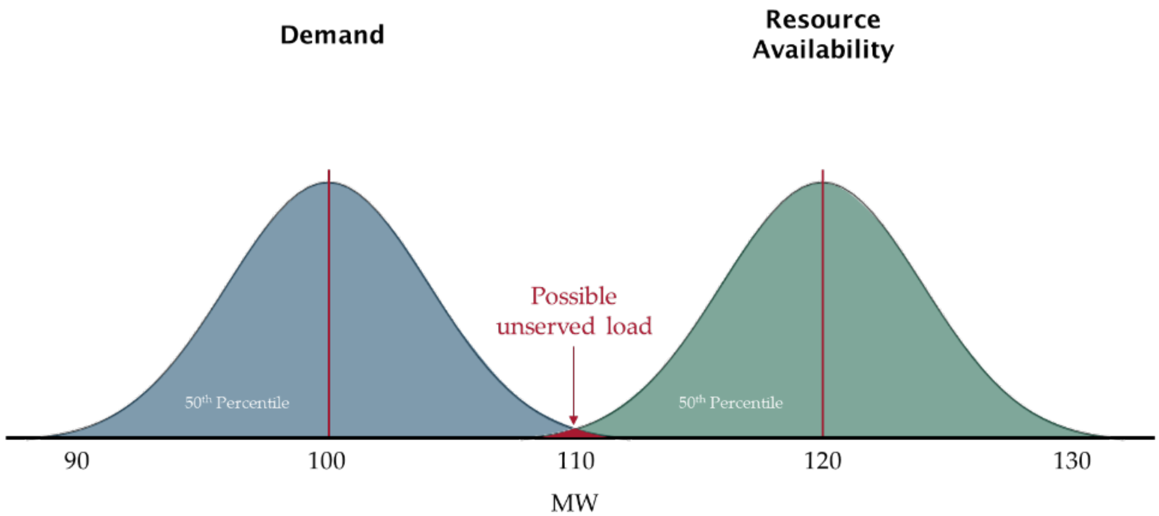

Figure 2: A Single Hour's View of the Probability Distributions of Demand and Resource Availability

Hourly Variability

Over 80% of new electricity capacity are renewables.[1] Concurrently, climate change is contributing to record peak demand by skewing the probability of previously rare weather, like widespread and long-lasting heat dome events.

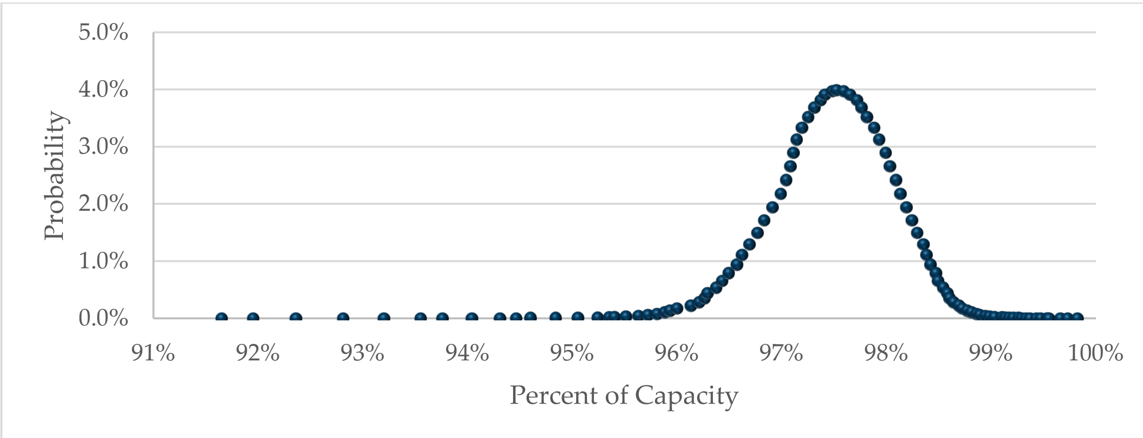

Figure 3: Baseload Availability Probability Distribution Example

Historically, electricity demand peaked on weekdays in the early evenings when many people get home from work. This timing typically coincides with a setting sun. So, just as electricity system operators are looking for resource availability to ramp up generation to meet the spiking demand, at least the solar resources' availabilities are dropping.

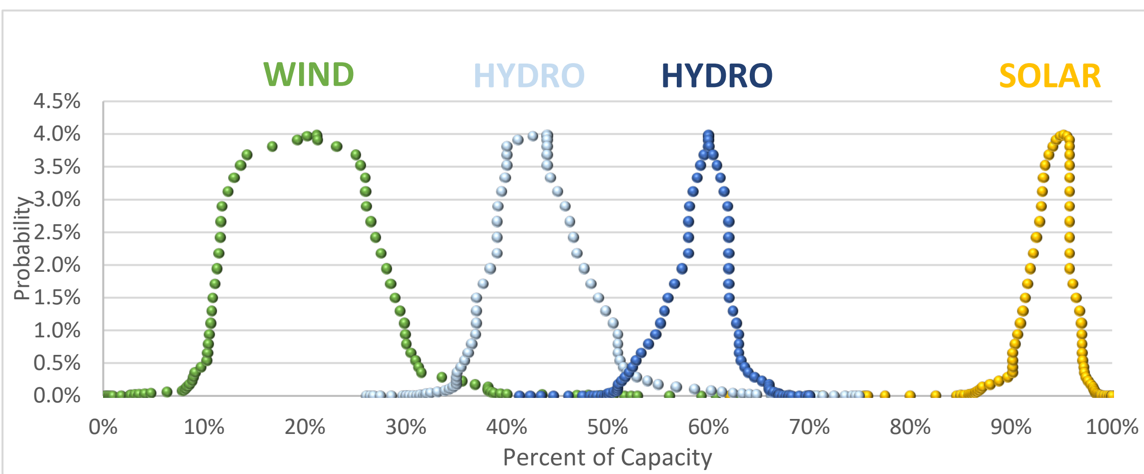

Figure 4: Renewables' Availability Probability Distributions Example

To combat the ramping risk, many planners are turning to long-term energy storage, either via hydro reservoirs, utility-scale batteries, or the incorporation of other new technologies like hydrogen, as well

1 Some good news on energy—The New York Times (nytimes.com) October 25, 2022

as the traditional use of natural gas peaker plants. The combinations of new and conventional resource types make new shapes of availability.

WECC is interested in looking at every hour so this aspect of a changing system is regularly analyzed to ensure reliability and spot potential issues years in advance.

Imports' Availability Assumptions

The West's system is large, and its diversity increases reliability because Balancing Authority Areas (BAA) can often rely on each other for imports. In planning, sometimes a limit is set for how many megawatts of imports will be available.

Since WECC collects loads and resources information from all of the BAAs throughout the West, and conducts probabilistic assessments of availability and demand, WECC can see when and where imports may not be sufficient to cover shortfalls of internal availability to meet demand.

Doing this analysis at the hourly level provides greater insights by identifying specific situational risk.

Conclusion

There are many ways to perform probabilistic studies, each with its strengths and weaknesses. The tool used to perform the probabilistic calculations depends on the system and the desired output that is being analyzed. In the Western Interconnection, a system that is geographically diverse and depends on transfer capabilities, WECC developed the Multiple Area Variable Resource Integration Convolution (MAVRIC) model to enhance its probabilistic capabilities. Using convolution techniques, Monte-Carlo simulations, and the ability to use transfers dynamically, MAVRIC can better model the overall reliability of the Western Interconnection while maintaining adequate run-time and computing capabilities.